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View over the city of Kangding from the Guanyin Monastery with *Betula potaninii* in the foreground.

Betula potaninii in Sichuan

After travelling in Chinese Sichuan, ERIC WAHLSTEEN[1] here describes his experiences of *Betula potaninii* in the wild and discusses the species and its relatives.

In autumn 2009, I travelled in western Sichuan with the aim of seeing and collecting the fairly recently described *Sorbus gonggashanica* (McAllister 2005) growing in the foothills of mount Gongga. We lived with a family in the Tibetan village of Liuba, mentioned by Lancaster (2008). The village is nowadays an important base camp for mountaineers climbing the Gongga Mountain. Returning from Liuba, we stayed a few days in the city of Kangding (2,500 m) and browsed the slopes around the city. The slopes facing south were poorly vegetated with caraganas, roses, non-climbing honeysuckles and evergreen oaks. The north and northwest facing slopes were mainly planted with *Pinus armandii* and were easily accessible by a trail leading to the top of the mountain called Paoma Shan (2,800 m). Walking up the trail, we passed several openings in the forest covered with dense thickets of a very distinct small leaved birch, *Betula potaninii* (EW09104). The name commemorates the Russian naturalist and explorer Grigori Nikolaevich Potanin (1835–1920) who made four great journeys into East Asia between 1876 and 1894. The species

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was described in 1893 by the Russian botanist Alexander Batalin (1847–1896) from material collected by Potanin on the slopes around Kangding.

Also today, in this area, *Betula potaninii* forms man-high shrubs with grey to silver grey bark and slender brown twigs with small, deeply veined leathery leaves. The autumn colours are scarce but somewhat tinged in yellow and brown. With a hand lens the small nearly un-winged nutlets and the bracts shaped like a bird's foot or a fleur-de-lys were distinctive and confirmed the identification.

Identification and literature

Betula potaninii is accepted as a good species in *Flora of China* (Li and Skvortsov 1999) and mentioned in *New Trees — Recent Introductions to Cultivation* (Grimshaw & Bayton, 2009). In Ashburner and McAllister 2013 this species maybe for the first time gets a proper examination and record.

Neither Diels (1901) nor Schneider (1906–1912) mention the species and it was not yet described when Franchet (1884–1888) summarized David's collections. However, Wilson and Sargent (1914–1916) mention that the species was common in western Sichuan in the areas of Wa-shan, Mupin (Baoxing), Songpan and Kuan Hsien where it grows as a shrub from one to three metres.

New findings

Two years later, I returned to Sichuan to see the virgin forests of the Northern Province. Our target was the UNESCO World Heritage Site of Jiuzhaigou National Park in northeast of Aba County. We went to the farthest part of the Ri Ze Valley and walked from the area called The Virgin Forest down to Swan Lake (3,060–2,900 m). The forest mainly consisted of mature *Abies fargesii* and *Juniperus convallium* with the shining barks of *Betula albosinensis*, botanically close to *Betula utilis* var. *prattii* (considered by McAllister, 2013, to be both referable to *B. utilis* subsp. *albosinensis*), and *Acer caudatum* with peeling copper bark. In the understory, several rhododendrons such as *Rhododendron oreodoxa* and many species of subsection Triflora occurred. Occasionally, the deep forests were cut by heavy screes where new pioneer species could establish. On the screes we found isolated specimens of a very small leaved birch (WBL11038) in all characters similar to *Betula potaninii* which was found outside Kangding in 2009.

I would, with regard to the distribution given in the *Flora of China* (1999) and Ashburner and McAllister (2013), also call the small-leaved Jiuzhaigou specimen, *Betula potaninii*.

After Jiuzhaigou we went further south and visited the national park of Huanglong and Danyunxia Scenic Area (2,000 m) 20 miles (35 km) east from the national park. The solemn and serene Danyunxia is the opposite of the tourist-crowded world famous national parks of Sichuan. With no trails to

reach the steep slopes we walked through the bottom of the valley under the canopy of *Picea asperata*, *Tilia chinensis* and several maples. Together with *Viburnum betulifolium*, *Buxus bodinieri* and white fruited rowans, again a small -leaved bushy birch (WBL11091) was growing on the road embankments. No doubt it was the same species as was found in Jiuzhaigou.

Taxonomy

Ashburner and McAllister (2013) place *B. potaninii* in subsection Asperae together with *B. schmidtii* (E China, E Russia, Japan and Korea), *B. chichibuensis* (Japan), *B. bomiensis* (Tibet), *B. calcicola, B. delavayi, B. gynoterminalis* and *B. skvortsovii* (all from SW China).

Among the related species, *B. delavayi* forms a small tree and has papery leaves with abaxially insignificantly raised veins and significantly larger fruiting catkins and seeds and is also glandular, unlike *B. potaninii*. Thus, it is unlikely that is was *B. delavayi* that was found in Jiuzhaigou and Danynxia. *Betula gynoterminalis* and *B. calcicola* are restricted to northwest Yunnan but share some similarities with *B. potaninii*. *Betula calcicola* differs mainly in leaf and bud shape, much greater hairiness of its shoots and buds, and small characters of the female inflorescence. The newly described *B. skvortsovii* differs from *B. potaninii* mainly in its smooth leaves (not indented veins) and only glandular leaves (not glandular branches). Finally, *Betula bomiensis* remains. Li and Skvortsov (1999) refer to it as a synonym of *B. delavayi* var. *microstachya*. Ashburner and McAllister (2013) keep the species level and argue that *B. bomiensis* has shorter, much more deeply ribbed leaves and fewer lateral veins than *B. delavayi*. Additionally, Hugh McAllister has shown that the population of *B. bomiensis* in southeast Tibet is tetraploid (2n=4x=56), whereas *B. delavayi* from Yunnan is hexaploid (2n=6x=84) (Rushforth 2003).

The description of *B. bomiensis* by Rushforth (2003) and later by Ashburner and McAllister (2013) reminds one of the characters of *Betula potaninii* which also has deeply veined (ribbed) short leaves. When compared, *B. potaninii* is described as having 2–2.5 cm long leaves and *B. bomiensis* has 1.5–2 cm. *B. potaninii* has 9–21 lateral veins and *B. bomiensis* has 5–15. *B. potaninii* occurs in southeast Gansu, Shaanxi, north and west Sichuan; *B. bomiensis* in Gansu, west Hubei, Qinghai, west Sichuan and northeast Tibet. It seems to me more appropriate to compare the small-leaved *B. bomiensis* with *B. potaninii* than with *B. delavayi*.

Recently McAllister and Rushforth (2011) distinguished the bushy tree-line form of *Betula utilis* as the new taxon *Betula ashburneri*. The new taxon is found from Bhutan in the west through southeast Tibet, northwest Yunnan and northeast to Zheduo near Kangding in west Sichuan and there is a recent record from the adjacent province of Shaanxi. Around lake Mugecuo outside Kangding, we saw the multi-stemmed low birches, today distinguished as *Betula ashburneri* when we travelled there in 2009. Despite its shrubby

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Above, the leaf blade of *Betula potaninii* is leathery, ovate or oblong to lanceolate and has veins adaxially deeply impressed (EW09104).
Below, A two year old seedling of *Betula potaninii* (EW09104).

appearance it has very little to do with *Betula potaninii*. The leaves of *Betula potaninii* are much smaller, the twigs are slender, the female catkins differ in shape, and the wingless seeds and total absence of glands are definitive characteristics. Finally *Betula ashburneri* grows larger.

The three specimens of *B. potaninii* from Kangding, Danyunxia and Jiuzhaigou were analyzed using a flow cytometer (Plant Cytometry Services, Holland) to determine DNA ratios and ploidy levels. DNA ratios were determined by comparing each sample with an internal standard, *Vinca minor*, with a known genome size. The specimens from north Sichuan (WBL11091 & WBL11038) were compared with the Kangding specimen (EW09104) as control when

Comparison of the specimens mentioned in the text and the diagnostic description of *Betula potaninii* in *Flora of China* (Li and Skvortsov 1999).

Specimen	Leaf blade			Cytology	
	Length (mm)	Width (mm)	Lateral veins (number)	Ploidy	Relative DNA ratio
EW09104 (Kangding)	24–35	11–17	11–15	2x	0.26
WBL11091 (Danyunxia)	17–30	10–16	10–14	2x	0.23
WBL11038 (Jiuzaighou)	20–30	9–15	9–10	2x	0.24
Ashburner/McAllister (2013)	20–51	11–24	9–21	2x	

ploidy level was determined. The results show that all the samples had about the same quantity of DNA (0.24 pg) and the two specimens of north Sichuan have the same ploidy level as that from Kangding.

Considering the morphological characteristics of relevant species in addition to the relative DNA ratios and ploidy level, it appears more likely that the shrubby birches of Jiuzhaigou and Danyunxia are *B. potaninii*, than any other species. As with many species in these remote mountains, more detailed

Left, *Betula potaninii* (WBL11091) in the Danyunxia valley East of Huanglong, Northern Sichuan.
Right, *Betula potaninii* (WBL11038) in a steep scree in Jiuzhaigou National Park in North East Sichuan.

investigations are required to work out the distribution of and morphological variation within *B. potaninii*. However, the observations described here suggest that *B. potaninii* may be more widespread than previously thought and that some of its populations are quite extensive.

Propagation

Placed outdoors in November, seed of the 2009 collection was easy to germinate. The seed was sown in standard compost and the seedlings were pricked out during spring in the usual way.

Softwood cuttings taken as soon as the first leaf on the elongating part of a long shoot has reached its full size root quickly in mist. If these are potted on as soon as roots begin to form and grown on as rapidly as possible, good survival has been achieved through the subsequent winter. Whether cuttings of older bushes bearing catkins would root as readily is uncertain.

Betula potaninii is not presently in cultivation in Swedish collections, and therefore I have never seen mature cultivated specimens other than my own seedlings. For a fully extended account of cultivation, please see Ashburner and McAllister (2013).

Future in cultivation

I'm not sure whether *Betula potaninii* will be the big garden gem of the future, but it is a thrilling species suitable for small to medium sized gardens. In Sweden at least, it appealed to many collectors and gardeners when it was released during the summer of 2012.

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